

What is claimed is:

1. A foamed isocyanate-based polymer derived from a reaction mixture comprising an isocyanate, an active hydrogen-containing compound, a dendritic macromolecule and a blowing agent; wherein at least a 15% by weight of the dendritic macromolecule may be mixed with a polyether polyol having an OH number less than about 40 mg KOH/g to form a stable liquid at 23°C.
2. A foamed isocyanate-based polymer derived from an isocyanate and an active hydrogen-containing compound, the polymer having a cellular matrix comprising a plurality of interconnected struts, the active hydrogen-containing compound conferring to the cellular matrix a load efficiency of at least about 15 Newtons/weight % active hydrogen-containing compound.
3. The foamed isocyanate-based polymer defined in claim 2, wherein the active hydrogen-containing compound confers to the cellular matrix a load efficiency of at least in the range of from about 15 to about 50 Newtons/weight % active hydrogen-containing compound.
4. The foamed isocyanate-based polymer defined in claim 2, wherein the active hydrogen-containing compound confers to the cellular matrix a load efficiency of at least in the range of from about 20 to about 45 Newtons/weight % active hydrogen-containing compound.
5. The foamed isocyanate-based polymer defined in claim 2, wherein the active hydrogen-containing compound confers to the cellular matrix a load efficiency of at least in the range of from about 25 to about 35 Newtons/weight % active hydrogen-containing compound.

6. A foamed isocyanate-based polymer having a cellular matrix derived from an active hydrogen-containing compound and comprising a plurality of interconnected struts, the cellular matrix: (i) having a load efficiency of at least about 15 Newtons/weight % active hydrogen-containing compound., and (ii) being substantially free of particulate material.

7. The foamed isocyanate-based polymer defined in claim 6, wherein the active hydrogen-containing compound confers to the cellular matrix a load efficiency of at least in the range of from about 15 to about 50 Newtons/weight % active hydrogen-containing compound.

8. The foamed isocyanate-based polymer defined in claim 6, wherein the active hydrogen-containing compound confers to the cellular matrix a load efficiency of at least in the range of from about 20 to about 45 Newtons/weight % active hydrogen-containing compound.

9. The foamed isocyanate-based polymer defined in claim 6, wherein the active hydrogen-containing compound confers to the cellular matrix a load efficiency of at least in the range of from about 25 to about 35 Newtons/weight % active hydrogen-containing compound.

10. A foamed isocyanate-based polymer derived from a reaction mixture comprising an isocyanate, an active hydrogen-containing compound, a dendritic macromolecule and a blowing agent; the foamed isocyanate-based polymer having an Indentation Force Deflection loss when measured pursuant to ASTM D3574 which is less than that of a reference foam produced by substituting a copolymer polyol for the dendritic macromolecule in the reaction mixture, the foamed isocyanate-based polymer and the reference foam having substantially the same density and Indentation Force Deflection when measured pursuant to ASTM D3574.

11. A foamed isocyanate-based polymer derived from a reaction mixture comprising an isocyanate, an active hydrogen-containing compound, a dendritic macromolecule and a blowing agent; the foamed isocyanate-based polymer having thickness loss when measured pursuant to ASTM D3574 which is less than that of a reference foam produced by substituting a copolymer polyol for the dendritic macromolecule in the reaction mixture, the foamed isocyanate-based polymer and the reference foam having substantially the same density and Indentation Force Deflection when measured pursuant to ASTM D3574.

12. A process for producing a foamed isocyanate-based polymer comprising the steps of:
contacting an isocyanate, an active hydrogen-containing compound, a dendritic macromolecule and a blowing agent to form a reaction mixture; and
expanding the reaction mixture to produce the foamed isocyanate-based polymer;
wherein at least a 15% by weight of the dendritic macromolecule may be mixed with a polyether polyol having an OH number less than about 40 mg KOH/g to form a stable liquid at 23°C.

13. The process defined in claim 12, wherein the active hydrogen-containing compound is selected from the group comprising polyols, polyamines, polyamides, polyimines and polyolamines.

14. The process defined in claim 12, wherein the active hydrogen-containing compound comprises a polyol.

15. The process defined in claim 14, wherein the polyol comprises a hydroxyl-terminated backbone of a member selected from the group comprising polyether, polyesters, polycarbonate, polydiene and polycaprolactone.

16. The process defined in claim 14, wherein the polyol is selected from the group comprising hydroxyl-terminated polyhydrocarbons, hydroxyl-terminated polyformals, fatty acid triglycerides, hydroxyl-terminated polyesters, hydroxymethyl-terminated polyesters,

hydroxymethyl-terminated perfluoromethylenes, polyalkyleneether glycols, polyalkylenearyleneether glycols, polyalkyleneether triols and mixtures thereof.

17. The process defined in claim 14, wherein the polyol is selected from the group comprising adipic acid-ethylene glycol polyester, poly(butylene glycol), poly(propylene glycol) and hydroxyl-terminated polybutadiene.

18. The process defined in claim 14, wherein the polyol is a polyether polyol.

19. The process defined in claim 18, wherein the polyether polyol has a molecular weight in the range of from about 200 to about 10,000.

20. The process defined in claim 18, wherein the polyether polyol has a molecular weight in the range of from about 2000 to about 7,000.

21. The process defined in claim 18, wherein the polyether polyol has a molecular weight in the range of from about 2,000 to about 6,000.

22. The process defined in claim 12, wherein the active hydrogen-containing compound is selected from group comprising a polyamine and a polyalkanolamine.

23. The process defined in claim 22, wherein the polyamine is selected from the group comprising primary and secondary amine terminated polyethers.

24. The process defined in claim 12, wherein the polyether have a molecular weight of greater than about 230.

25. The process defined in claim 12, wherein the polyether have a functionality of from about 2 to about 6.

26. The process defined in claim 12, wherein the polyether have a molecular weight of greater than about 230 and a functionality of from about 1 to about 3.

27. The process defined in claim 12, wherein the isocyanate is represented by the general formula:



wherein i is an integer of two or more and Q is an organic radical having the valence of i.

28. The process defined in claim 12, wherein the isocyanate is selected from the group comprising hexamethylene diisocyanate, 1,8-diisocyanato-p-methane, xylyl diisocyanate, $(OCNCH_2CH_2CH_2OCH_2O)_2$, 1-methyl-2,4-diisocyanatocyclohexane, phenylene diisocyanates, tolylene diisocyanates, chlorophenylene diisocyanates, diphenylmethane-4,4'-diisocyanate, naphthalene-1,5-diisocyanate, triphenylmethane-4,4',4''-triisocyanate, isopropylbenzene-alpha-4-diisocyanate and mixtures thereof.

29. The process defined in claim 12, wherein the isocyanate comprises a prepolymer.

30. The process defined in claim 12, wherein isocyanate is selected from the group comprising 1,6-hexamethylene diisocyanate, 1,4-butylene diisocyanate, furfurylidene diisocyanate, 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 2,4'-diphenylmethane diisocyanate, 4,4'-diphenylmethane diisocyanate, 4,4'-diphenylpropane diisocyanate, 4,4'-diphenyl-3,3'-dimethyl methane diisocyanate, 1,5-naphthalene diisocyanate, 1-methyl-2,4-diisocyanate-5-chlorobenzene, 2,4-diisocyanato-s-triazine, 1-methyl-2,4-diisocyanato cyclohexane, p-phenylene diisocyanate, m-phenylene diisocyanate, 1,4-naphthalene diisocyanate, dianisidine diisocyanate, bitolylene diisocyanate, 1,4-xylylene diisocyanate, 1,3-xylylene diisocyanate, bis-(4-isocyanatophenyl)methane, bis-(3-methyl-4-isocyanatophenyl)methane, polymethylene polyphenyl polyisocyanates and mixtures thereof.

31. The process defined in claim 12, wherein the isocyanate is selected from the group comprising 2,4-toluene diisocyanate, 2,6-toluene diisocyanate and mixtures thereof.

32. The process defined in claim 12, wherein the isocyanate is selected from the group consisting essentially of (i) 2,4'-diphenylmethane diisocyanate, 4,4'-diphenylmethane diisocyanate and mixtures thereof; and (ii) mixtures of (i) with an isocyanate selected from the group comprising 2,4-toluene diisocyanate, 2,6-toluene diisocyanate and mixtures thereof.

33. The process defined in claim 12, wherein the blowing agent comprises water.

34. The process defined in claim 33, wherein the water is used in an amount in the range of from about 0.5 to about 40 parts by weight per 100 parts by weight of active hydrogen-containing compound used in the reaction mixture.

35. The process defined in claim 33, wherein the water is used in an amount in the range of from about 1.0 to about 10 parts by weight per 100 parts by weight of active hydrogen-containing compound used in the reaction mixture.

36. The process defined in claim 12, wherein dendritic macromolecule has the following characteristics:

- (i) an active hydrogen content of greater than about 3.8 mmol/g;
- (ii) an active hydrogen functionality of at least about 8; and
- (iii) at least a 15% by weight of the dendritic macromolecule may be mixed with a polyether polyol having an OH number less than about 40 mg KOH/g to form a stable liquid at 23°C.

37. The process defined in claim 36, wherein from about 15% to about 30% by weight of the dendritic macromolecule may be mixed with a polyether polyol having an OH number less than about 40 mg KOH/g to form a stable liquid at 23°C

38. The process defined in claim 36, wherein at least a 15% by weight of the dendritic macromolecule may be mixed with a polyether polyol having an OH number in the range of from about 25 to 35 mg KOH/g to form a stable liquid at 23°C.

39. The process defined in claim 36, wherein at least a 15% by weight of the dendritic macromolecule may be mixed with a polyether polyol having an OH number in the range of from about 28 to 32 mg KOH/g to form a stable liquid at 23°C.

40. The process defined in claim 36, wherein the active hydrogen is present in the macromolecule in the form of one or more mercapto moieties.

41. The process defined in claim 36, wherein the active hydrogen is present in the macromolecule in the form of one or more primary amino moieties.

42. The process defined in claim 36, wherein the active hydrogen is present in the macromolecule in the form of one or more secondary amino moieties.

43. The process defined in claim 36, wherein the active hydrogen is present in the macromolecule in the form of one or more hydroxyl moieties.

44. The process defined in claim 36, wherein the active hydrogen is present in the macromolecule in the form of two or more of a mercapto moiety, a primary amino moiety, a secondary amino moiety and a hydroxyl moiety.

45. The process defined in claim 36, wherein the active hydrogen content of the macromolecule is in the range of from about 3.8 to about 10 mmol/g.

46. The process defined in claim 36, wherein the active hydrogen content of the macromolecule is in the range of from about 3.8 to about 7.0 mmol/g.

47. The process defined in claim 36, wherein the active hydrogen content of the macromolecule is in the range of from about 4.4 to about 5.7 mmol/g.

48. The process defined in claim 36, wherein the active hydrogen functionality in the macromolecule is in the range of from about 8 to about 70.

49. The process defined in claim 36, wherein the active hydrogen functionality in the macromolecule is in the range of from about 10 to about 60.

50. The process defined in claim 36, wherein the active hydrogen functionality in the macromolecule is in the range of from about 15 to about 35.

51. The process defined in claim 36, wherein the active hydrogen functionality in the macromolecule is in the range of from about 20 to about 30.

52. The process defined in claim 36, wherein from about 15% to about 50% by weight of the dendritic macromolecule may be mixed with a polyether polyol having an OH number less than about 40 mg KOH/g to form a stable liquid at 23°C

53. The process defined in claim 36, wherein from about 15% to about 40% by weight of the dendritic macromolecule may be mixed with a polyether polyol having an OH number less than about 40 mg KOH/g to form a stable liquid at 23°C.

54. The process defined in claim 36, wherein the macromolecule has an inherently branched structure comprising at least one of an ester moiety, an ether moiety, an amine moiety, an amide moiety and any mixtures thereof.

55. The process defined in claim 36, wherein the macromolecule has an inherently branched structure comprising primarily an ester moiety, optionally combined with an ether moiety.

56. The process defined in claim 36, wherein the macromolecule has an inherently branched structure comprising primarily an ether moiety, optionally combined with an ester moiety.

57. The process defined in claim 36, wherein the macromolecule has an inherently branched structure comprising primarily an ester moiety, optionally combined with an ether moiety.

58. The process defined in claim 54, wherein the macromolecule further comprises a nucleus to which the inherently branched structure is chemically bonded.

59. The process defined in claim 54, wherein a plurality of inherently branched structures are chemically bonded to one another.

60. The process defined in claim 54, wherein the inherently branched structure further comprises at least one chain stopper moiety chemically bonded thereto.

61. The process defined in claim 54, wherein the inherently branched structure further comprises at least two different chain stopper moieties chemically bonded thereto.

62. The process defined in claim 54, wherein the inherently branched structure further comprises at least one spacing chain extender chemically bonded thereto.

63. The process defined in claim 62, wherein the spacing chain extender is monomeric.

64. The process defined in claim 62, wherein the spacing chain extender is polymeric.

65. A process for conferring load bearing properties to a foamed isocyanate-based polymer derived from a mixture comprising an isocyanate, an active hydrogen-containing compound and a blowing agent comprising the step of incorporating a dendritic macromolecule in the reaction mixture;

wherein at least a 15% by weight of the dendritic macromolecule may be mixed with a polyether polyol having an OH number less than about 40 mg KOH/g to form a stable liquid at 23°C.

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